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TRANSMITTAL LETTER TO THE UNITED STATES DESIGNATED/ELECTED OFFICE (DO/EO/US) CONCERNING A FILING UNDER 35 U.S.C. 371

U.S. APPLICATION NO. (If known see 37 C.F.R. 1.5)
09/719696

INTERNATIONAL APPLICATION NO.	INTERNATIONAL FILING DATE	(EARLIEST) PRIORITY DATE CLAIMED
PCT/JP99/02042	**APRIL 16, 1999**	**APRIL 16, 1999**

TITLE OF INVENTION: **DATA TRANSMISSION METHOD AND DATA TRANSMISSION APPARATUS**

APPLICANT(S) FOR DO/EO/US: **Katsumi TAHARA, Yoshihiro MURAKAMI and James Hedley WILKINSON**

Applicants herewith submit to the United States Designated/Elected Office (DO/EO/US) the following items and other information:

1. ☒ This is a **FIRST** submission of items concerning a filing under 35 U.S.C. 371.
2. ☐ This is a **SECOND** or **SUBSEQUENT** submission of items concerning a filing under 35 U.S.C. 371.
3. ☒ This is an express request to promptly begin national examination procedures (35 U.S.C. 371(f)).
4. ☐ The US has been elected by the expiration of 19 months from the priority date (PCT Article 31).
5. ☒ A copy of the International Application as filed (35 U.S.C. 371(c)(2))
   a. ☐ is attached hereto (required only if not communicated by the International Bureau).
   b. ☒ has been communicated by the International Bureau.
   c. ☐ is not required, as the application was filed in the United States Receiving Office (RO/US).
6. ☒ An English language translation of the International Application as filed (35 U.S.C. 371(c)(2)).
7. ☒ Amendments to the claims of the International Application under PCT Article 19 (35 U.S.C. 371(c)(3))
   a. ☐ are attached hereto (required only if not communicated by the International Bureau).
   b. ☐ have been communicated by the International Bureau.
   c. ☐ have not been made; however, the time limit for making such amendments has NOT expired.
   d. ☒ have not been made and will not be made.
8. ☐ A English language translation of the amendments to the claims under PCT Article 19 (35 U.S.C. 371(c)(3)).
9. ☐ An oath or declaration of the inventor(s) (35 U.S.C. 371(c)(4)).
10. ☐ An English language translation of the annexes to the International Preliminary Examination Report under PCT Article 36 (35 U.S.C. 371(c)(5)).

Items 11 to 16 below concern document(s) or information included:

11. ☒ An Information Disclosure Statement under 37 CFR 1.97 and 1.98.
12. ☐ An assignment document for recording. A separate cover sheet in compliance with 37 CFR 3.28 and 3.31 is included.
13. ☐ A FIRST preliminary amendment.
    ☐ A SECOND or SUBSEQUENT preliminary amendment.
14. ☐ A substitute specification.
15. ☐ A change of power of attorney and/or address letter.
16. ☒ Other items or information:
    PCT/ISA/210, PCT/IB/301, 308
    20 Sheets of Drawings, 1 Page of Abstract

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APPLICATION NO. (If known, see 37 C.F.R. 1.50)	INTERNATIONAL APPLICATION NO.	ATTORNEY'S DOCKET NO.
09/719696	PCT/JP99/02042	450119-4960

17. ☒ The following fees are submitted (CALCULATIONS /PTO USE ONLY

Basic National Fee (37 CFR 1.492(a)(1)-(5):

Neither international preliminary examination fee (37 CFR 1.482) nor international search fee (37CFR 1.445(a)(2) paid to USPTO and International Search Report not prepared by the EPO or JPO **$1,000.00**

International preliminary examination fee (37 C.F.R. 1.482) not paid to USPTO but International Search Report prepared by the EPO or JPO . $ 860.00

International preliminary examination fee (37 CFR 1.482) not paid to USPTO but international search fee (37 CFR 1.445(a)(2)) paid to USPTO ..... $ **710.00**

International preliminary examination fee paid to USPTO (37 CFR 1.482) but all claims did not satisfy provisions of PCT Article 33(1)-(4)..... $ **690.00**

International preliminary examination fee paid to USPTO (37 CFR 1.482) and all claims satisfied provisions of PCT Article 33(1)-(4)..... $ **100.00**

ENTER APPROPRIATE BASIC FEE AMOUNT = **($ 860.00**

Surcharge of **$130.00** for furnishing the oath or declaration later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492(e)). ($

20 Claims	/Number Filed	/ Number Extra	/Rate	($
Total Claims	/ **20** - 20 =	/ **0**	/X **$18.00**	($
Independent Claims	/ **10** - 3 =	/ **7**	/X **$80.00**	($ **560.00**
MULTIPLE DEPENDENT CLAIM(S) (if applicable)			/+ **$270.00**	($

TOTAL OF ABOVE CALCULATIONS = **($ 1420.00**

☐ Applicant claims small entity status. See 37 C.F.R. 1.27. The fees indicated above are reduced by ½. ($

SUBTOTAL = **($ 1420.00**

Processing fee of **$130.00** for furnishing the English translation later than ☐ 20 ☐ 30 months from the earliest claimed priority date (37 CFR 1.492(f)). ($ +

TOTAL NATIONAL FEE = **($ 1420.00**

Fee for recording the enclosed assignments (37 CFR 1.21(h)). The assignment must be accompanied by an appropriate cover sheet (37 CFR 3.28, 3.31). **$40.00** per property + ($ ($

TOTAL FEES ENCLOSED = **($ 1420.00**

(Amount to be refunded: $ -

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a. ☒ A check in the amount of **$1420.00** to cover the above fees is enclosed.

b. ☐ Please charge my Deposit Account No. ____ in the amount of $____ to cover the above fees. A duplicate copy of this sheet is enclosed.

c. ☒ The Commissioner is hereby authorized to charge any additional fees which may be required, or credit any overpayment to Deposit Account No. **50-0320**. A duplicate copy of this sheet is enclosed.

NOTE: Where an appropriate time limit under 37 CFR 1.494 or 1.495 has not been met, a petition to revive (37 CFR 1.137(a) or (b)) must be filed and granted to restore the application to pending status.

SEND ALL CORRESPONDENCE TO:

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Dated: December 14, 2000

Gordon Kessler
SIGNATURE

William S. Frommer by: GORDON KESSLER
NAME

25,506 # 38,511
REGISTRATION NUMBER

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DESCRIPTION

DATA TRANSMISSION METHOD AND DATA TRANSMISSION APPARATUS

TECHNICAL FIELD

This invention relates to a data transmission method and a data transmission apparatus for use in transmitting video data, audio data and metadata other than the video data and the audio data, or the like.

BACKGROUND ART

The SDI (Serial Digital Interface) format is standardized by SMPTE-259M of the SMPTE (Society of Motion Picture and Television Engineers) which issues standards concerning television engineering and video engineering. This SDI format is fundamentally a signal standard for the D-1 format or the D-2 format which may be a digital signal standard.

This SDI format is able to effect the transmission for only data of limited media. To be concrete, media that can be transmitted may be one channel of video data and about 8 channels of baseband audio data. For this reason, the SDI format is unsuitable for multimedia or multichannel.

Also, the SDTI (Serial Data Transport Interface) format is standardized by SMPTE-305M of the SMPTE. This SDTI format is suitable for multimedia or multichannel while the advantage of the SDI format is being effectively utilized and a common property with the SDI format is

being kept in part. This SDTI format is the standard for transmitting the baseband signal and is able to transmit an end synchronizing code (EAV: End of Active Video) and a start synchronizing code (SAV: Start of Active Video) together.

That is, according to the SDTI format, there can be transmitted a serial digital transfer interface transmission packet in which an interval of each line of a video frame comprises an area into which an EAV is inserted, an ancillary data area into which ancillary data is inserted (ancillary data portion ANC), an area into which an SAV is inserted and a payload area into which video data and audio data are inserted.

When the above-mentioned SDTI format is in use, the editing of a stream may be realized by switching. In this case, the NTSC system may use the 10th line as the switching timing, and the PAL system may use the 6th line as the switching timing. The switching may be executed at the timing using video data mainly. As a result, there is the risk that audio data will cause an audio gap due to the following reasons.

For example, when audio data having a sampling frequency of 48 kHz is equally divided into each frame of the NTSC system video signal having 525 lines/frame and 59.94 fields/second, the number of audio data samples per one video frame becomes 1601.6 samples (= (48 kHz/59.94 fields) x 2 fields) and does not become an integer. Therefore, when each sample of audio data is block-divided in correspondence with each video frame, 1601 samples or 1602 samples may be allocated to

each video frame.

In this case, since the number of audio data samples of 5 video frames becomes 8008 samples (= 5 x 1601.6 samples), the above-mentioned block division may be executed at the 5-frame sequence as shown in FIG. 22A. That is, the 5 frames comprising the first frame of 1602 samples, the second frame of 1601 samples, the third frame of 1602 samples, the fourth frame of 1601 samples and the fifth frame of 1602 samples may be repeated.

When the audio data is block-divided at the 5-frame sequence as described above, if the editing is executed by switching the stream as described above, there is then the risk that a continuity of 5-frame sequence will be lost. For example, if a 5-frame sequence of a stream STMa is presented as shown in FIG. 22A and is used as a reference phase, then as a phase pattern of a stream STMb which may be replaced with the stream STMa by switching, there may be considered five kinds of phase patterns shown in FIGS. 22B to F.

When the phase pattern of the stream STMb is presented as shown in FIG. 22B, the continuity of the 5-frame sequence can be prevented from being lost even though the switching is executed. However, when the phase patterns of the stream STMb are presented as shown in FIGS. 22C to F, the continuity of the 5-frame sequence will be lost. Depending on the switching timing, there occurs an interval (audio gap) in which frames of 1601 samples may continue to cause one audio data

sample to become insufficient.

When this audio gap is reproduced as it is, an audio waveform becomes discontinuous. There is then the risk that a large noise that cannot be expected will occur. Therefore, an editing point at which the audio gap will occur should be detected, and sounds should be muted upon reproduction.

An object of this invention is to enable the receiving side to easily execute a processing such as muting sounds necessary for an editing point. Also, an object of this invention is to enable the stream switching point generated in a transmission line to be easily detected as an editing point.

DISCLOSURE OF INVENTION

A data transmission method according to this invention is a data transmission method for transmitting a serial digital transfer interface transmission packet in which an interval of each line of a video frame comprises an end synchronizing code area into which an end synchronizing code is inserted, an ancillary data area into which ancillary data is inserted, a start synchronizing code area into which a start synchronizing code is inserted and a payload area into which main data comprising video data and/or audio data is inserted. This data transmission method comprises a first step of inserting first data containing extension data having editing point information at the picture

unit of the video data and second data containing the main data into the payload area and a second step of transmitting the transmission packet in which the first data and the second data are inserted into the payload area at this first step in the form of serial data.

For example, the above-mentioned editing point information uses a picture unit having the editing point information as an object picture unit, and indicates whether or not the object picture unit is unrelated to the editing point, whether or not the editing point is located ahead of the object picture unit, whether or not the editing point is located behind the object picture unit and whether or not the editing point is located ahead of and behind the object picture unit.

Also, a data transmission apparatus according to this invention is a data transmission apparatus for transmitting a serial digital transfer interface transmission packet in which an interval of each line of a video frame comprises an end synchronizing code area into which an end synchronizing code is inserted, an ancillary data area into which ancillary data is inserted, a start synchronizing code area into which a start synchronizing code is inserted and a payload area into which main data comprising video data and/or audio data is inserted. This data transmission apparatus includes a means for inserting first data containing extension data having editing point information at the picture unit of the video data and second data containing the main data into the payload area and a means for transmitting the transmission packet in

which the first data and the second data were inserted into the payload area in the form of serial data.

According to this invention, the first data containing the extension data having the editing point information at the picture unit of the video data and the second data containing the main data comprising the video data and/or audio data are inserted into the payload area. Therefore, the receiving side is able to detect by using editing point information an editing point at which the audio gap will occur as described above, and becomes able to effect a necessary processing such as muting of sounds on the editing point.

A data transmission method according to this invention is a data transmission method for transmitting a serial digital transfer interface transmission packet in which an interval of each line of a video frame comprises an end synchronizing code area into which an end synchronizing code is inserted, an ancillary data area into which ancillary data is inserted, a start synchronizing code area into which a start synchronizing code is inserted and a payload area into which main data comprising video data and/or audio data is inserted. This data transmission method comprises a first step for inserting first data containing extension data having data of a count value counted at the picture unit of the video data at every picture unit and second data containing the main data into the payload area and a second step for transmitting the transmission packet in which the first data and the

second data were inserted into the payload area in the form of serial data.

Also, a data transmission apparatus according to this invention is a data transmission apparatus for transmitting a serial digital transfer interface transmission packet in which an interval of each line of a video frame comprises an end synchronizing code area into which an end synchronizing code is inserted, an ancillary data area into which ancillary data is inserted, a start synchronizing code area into which a start synchronizing code is inserted and a payload area into which main data comprising video data and/or audio data is inserted. This data transmission apparatus includes a means for inserting first data containing extension data having data of a count value counted at the picture unit of the video data at every picture unit and second data containing the main data into the payload area and a means for transmitting the transmission packet in which the first data and the second data were inserted into the payload area in the form of serial data.

According to this invention, the first data containing the extension data having the data of the count value counted at the picture unit of the video data at every picture unit and the second data containing the main data comprising the video data and/or audio data are inserted into the payload area. When a stream is switched in a transmission line by a router switch (matrix switch), for example, the count value becomes discontinuous. Therefore, the receiving side is able to detect a switching point from the discontinuity of the count value, for example, as an editing

point, and becomes able to effect a necessary processing such as muting of sounds on the editing point.

A data reception method according to this invention is a data reception method for receiving a serial digital transfer interface transmission packet in which an interval of each line of a video frame comprises an end synchronizing code area into which an end synchronizing code is inserted, an ancillary data area into which ancillary data is inserted, a start synchronizing code area into which a start synchronizing code is inserted and a payload area into which first data containing main data comprising video data and/or audio data and second data containing extension data having editing point information at the picture unit of the video data are inserted. This data reception method includes a first step of receiving the transmission packet, a second step of extracting the main data and the extension data from the transmission packet received at the first step and a third step of transferring at least the editing point information within the extension data extracted at the second step and the main data extracted at the second step to a recording apparatus.

Also, a data reception apparatus according to this invention is a data reception apparatus for receiving a serial digital transfer interface transmission packet in which an interval of each line of a video frame comprises an end synchronizing code area into which an end synchronizing code is inserted, an ancillary data area into which ancillary

data is inserted, a start synchronizing code area into which a start synchronizing code is inserted and a payload area into which first data containing main data comprising video data and/or audio data and second data containing extension data having editing point information at the picture unit of the video data are inserted. This data reception apparatus includes a means for receiving the transmission packet, a means for extracting the main data and the extension data from the received transmission packet and a means for transferring at least the editing point information within the extension data extracted from the transmission packet and the main data extracted from the transmission packet to a recording apparatus.

According to this invention, the extension data having the editing point information at the picture unit of the video data and the main data comprising the video data and/or audio data are extracted from the received transmission packet and at least the editing point information and the main data are transferred to and recorded on a recording apparatus such as a VTR or a server. Therefore, when sounds based on the audio data recorded on the recording apparatus, for example, are outputted, an editing point at which an audio gap will occur can be detected by effectively utilizing editing point information. Then, it becomes possible to effect a processing such as muting of sounds on that editing point.

A sound output method according to this invention is a sound

output method for outputting sounds based on audio data extracted from a serial digital transfer interface transmission packet in which an interval of each line of a video frame comprises an end synchronizing code area into which an end synchronizing code is inserted, an ancillary data area into which ancillary data is inserted, a start synchronizing code area into which a start synchronizing code is inserted and a payload area into which first data containing main data comprising video data and/or audio data and second data containing extension data having editing point information at the picture unit of the video data are inserted. This sound output method includes a first step of outputting sounds based on audio data within the main data extracted from the transmission packet, a second step of detecting an editing point from the editing point information within the extension data extracted from the transmission packet and a third step of muting sounds outputted at the first step in correspondence with the editing point detected at the second step.

Also, a sound output apparatus according to this invention is a sound output apparatus for outputting sounds based on audio data extracted from a serial digital transfer interface transmission packet in which an interval of each line of a video frame comprises an end synchronizing code area into which an end synchronizing code is inserted, an ancillary data area into which ancillary data is inserted, a start synchronizing code area into which a start synchronizing code is inserted and a payload area into which first data containing main data comprising

video data and/or audio data and second data containing extension data having editing point information at the picture unit of the video data are inserted. This sound output apparatus includes a means for outputting sounds based on audio data within the main data extracted from the transmission packet, a means for detecting an editing point from the editing point information within the extension data extracted from the transmission packet and a means for muting the outputted sounds in correspondence with the detected editing point.

According to this invention, there are outputted sounds based on the audio data extracted from the transmission packet. In this case, the editing point is detected from the editing point information within the extension data extracted from the transmission packet, and sounds are muted at that editing point. Thus, even when an audio gap occurs at the editing point, it is possible to prevent a large jarring noise or the like from being outputted.

A data reception method according to this invention is a data reception method of receiving a serial digital transfer interface transmission packet in which an interval of each line of a video frame comprises an end synchronizing code area into which an end synchronizing code is inserted, an ancillary data area into which ancillary data is inserted, a start synchronizing code area into which a start synchronizing code is inserted and a payload area into which first data containing main data comprising video data and/or audio data and

second data containing data of a count value counted at the picture unit of the video data at every picture unit and extension data having editing point information are inserted. This data reception method includes a first step of receiving the transmission packet, a second step of extracting the main data and the extension data from the transmission packet received at the first step, a third step of detecting an editing point from a discontinuity of the data of the count value within the extension data extracted at the second step and a fourth step of correcting the editing point information within the extension data extracted at the second step in correspondence with the editing point detected at the third step.

Also, a data reception apparatus according to this invention is a data reception apparatus for receiving a serial digital transfer interface transmission packet in which an interval of each line of a video frame comprises an end synchronizing code area into which an end synchronizing code is inserted, an ancillary data area into which ancillary data is inserted, a start synchronizing code area into which a start synchronizing code is inserted and a payload area into which first data containing main data comprising video data and/or audio data and second data containing data of a count value counted at the picture unit of the video data at every picture unit and extension data having editing point information are inserted. This data reception apparatus includes a means for receiving a transmission packet, a means for extracting the main data and the extension data from the received transmission packet,

a means for detecting an editing point from a discontinuity of the data of the count value within the extension data extracted from the transmission packet and a means for correcting the editing point information within the extension data extracted from the transmission packet in correspondence with the detected editing point.

According to this invention, the extension data having the data of the count value counted at the picture unit of the video data at every picture unit and the editing point information and the main data comprising the video data and/or audio data are extracted from the received transmission packet. Then, the editing point is detected from the discontinuity of the data of the count value within the extension data, and the editing point information within the extension data is corrected in correspondence with the detected editing point. Thus, when a stream is switched in a transmission line by a router switch (matrix switch), for example, the switching point can be detected from the editing point information as the editing point. Then, it becomes possible to execute a processing such as muting of sounds.

BRIEF DESCRIPTION OF DRAWINGS

FIG. 1 is a diagram to which reference will be made in explaining the SDTI-CP format. FIG. 2 is a diagram showing an arrangement of a header provided within an ancillary data portion of the SDTI-CP format. FIG. 3 is a diagram showing a fundamental arrangement

of a contents package. FIG. 4 is a diagram showing the layout of a contents package using GOP of the MPEG-2. FIG. 5 is a diagram showing an arrangement of an SDTI variable-length block. FIG. 6 is a diagram showing an arrangement of a system item. FIG. 7 is a diagram showing an arrangement of a time code standardized as the SMPTE-12M. FIG. 8 is a diagram showing an arrangement of a metadata set. FIGS. 9A to 9C are diagrams showing an arrangement of "Item Metadata Block". FIG. 10 is a diagram showing arrangements of picture, audio and ancillary data items. FIG. 11 is a diagram showing an example of an MPEG-2 V-ES format in the SDTI-CP element frame. FIG. 12 is a diagram showing an arrangement of an 8-channel AES-3 element. FIG. 13 is a diagram to which reference will be made in explaining a 5-frame sequence. FIGS. 14A to 14C are diagrams to which reference will be made in explaining MPEG-2 image editing metadata. FIGS. 15A to 5D are diagrams to which reference will be made in explaining audio editing metadata. FIG. 16 is a block diagram showing an example of a transmission system of an SDTI-CP stream. FIG. 17 is a block diagram showing an arrangement of a main portion of a reproducing system provided within a storage device. FIG. 18 is a diagram showing an example of 2-bit editing point information. FIG. 19 is a diagram to which reference will be made in explaining the switching of SDTI-CP stream. FIG. 20 is a diagram used to explain the manner in which a discontinuity of a value of "Continuity Count" will occur due to the switching of stream. FIG. 21 is a block

diagram showing a portion concerning the correction of "Edit flag" in the SDTI-CP interface. FIGS. 22A to 22F are diagrams to which reference will be made in explaining the 5-frame sequence obtained when audio data is block-divided. FIG. 23 is a diagram to which reference will be made in explaining the manner in which an audio gap will occur due to the switching of stream.

BEST MODE FOR CARRYING OUT THE INVENTION

An embodiment according to this invention will hereinafter be described with reference to the drawings. In this embodiment, respective contents items (e.g. picture item (Picture Item) and audio item (Audio Item)) may be generated by packaging data such as video and audio sources, and one contents item (system item (System Item)) may be generated by packaging information concerning each contents item and metadata concerning each contents or the like. These contents items may be used as contents packages. Further, a transmission package may be generated from this contents package, and may be transmitted by using a serial digital transfer interface.

This serial digital transfer interface is adapted to transmit the above-mentioned content package by effectively utilizing a digital signal serial transmission format of an SMPTE-259M "10-bit 4:2:2 Component and 4fsc Composite Digital Signals-Serial Digital Interface" (hereinafter referred to as "serial digital interface SDI (Serial Digital Interface) format")

standardized by the SMPTE, for example, or the standard SMPTE-305M "Serial Data Transport Interface" (hereinafter referred to as "SDTI format") to transmit a digital signal which may be assembled into packets.

When the SDI format standardized by the SMPTE-259M is located in the video frame, an NTSC525 system digital video signal may comprise 1716 (4 + 268 + 4 + 1440) words per line in the horizontal direction and 525 lines in the vertical direction. Also, a PAL625 system digital video signal may comprise 1728 (4 + 280 + 4 + 1440) words per line in the horizontal direction and 625 lines in the vertical direction where 10 bits/word may be established.

With respect to each line, 4 words ranging from the first word to the fourth word may indicate the end of a 1440-word active video area which may be a video signal area, and may be used as an area to store a code EAV (End of Active Video) which may be used to separate the active video area and an ancillary data area, which will be described later on.

Also, with respect to each line, 268 words ranging from the fifth word to 272th word may be used as the ancillary data area to store header information or the like. 4 words ranging from 273th word to 276th word may indicate the start of the active video area, and may be used as an area to store a code SAV (Start of Active Video) which may be used to separate the active video area and the ancillary data area. Words following 277th word may be used as the active video area.

According to the SDTI format, the above-mentioned active video

area may be used as a payload area and the codes EAV and SAV may be used to indicate the end and the start of the payload area.

Here, data of respective items may be inserted into the payload area of the SDTI format as the contents packages, and the codes EAV and SAV of the SDI format may be added to the data of the respective items to thereby obtain data of the format shown in FIG. 1. When data of the format (hereinafter referred to as "SDTI-CP format") shown in FIG. 1 is transmitted, similarly to the SDI format and the SDTI format, this data may be P/S-converted and encoded in transmission line and thereby transmitted as serial data whose transmission rate is 270 Mbps, or the like.

Incidentally, in FIG. 1, numerals within the parentheses may represent numerical values of the PAL625 system video signal. Numerals without parentheses may represent numerical values of the NTSC525 system video signal. Only the NTSC system will be described below.

FIG. 2 shows arrangements of the code EAV and header data (Header Data) contained in the ancillary data area.

The code EAV may comprise 3FFh, 000h, 000h, XYZh (h may represent the hexadecimal notation, which will apply for the following description as well).

In the "XYZh", a bit b9 may be set to "1", and bits b0, b1 may be set to "0". A bit b8 may be a flag which may indicate whether the field is the first field or the second field. A bit b7 may be a flag which may indicate

the vertical blanking period. Also, a bit b6 may be a flag which may indicate whether the 4-word data is the EAV or the SAV. The flag of this bit b6 may be held at "1" when the 4-word data is the EAV, and may be held at "0" when the 4-word data is the SAV. Also, bits b5 to b2 may be data which may be used to detect and correct errors.

Next, to the leading portion of the header data, there may be located fixed patterns 000h, 3FFh, 3FFh as header recognition data "ADF (Ancillary data flag)". The fixed patterns may be followed by "DID (Data ID)" and "SDID (Secondary data ID)" which may indicate the attribute of the ancillary data area. In the "DID" and "SDID", there may be located fixed patterns 140h, 101h which may indicate that the attribute is a user application.

"Data Count" may indicate the number of words of the header data, and the number of words may be set to 46 words (22Eh). This header data may comprise data ranging from "Line Number-0" to "Header CRC1" as shown in FIG. 2.

"Line Number-0, Line Number-1" may be data which may indicate a television line number. In the NTSC525 system, these two words may represent the line numbers 1 to 525 of the video frame. Also, in the PAL625 system, these two words may represent the line numbers 1 to 625 of the video frame.

The "Line Number-0, Line Number-1" may be followed by "Line Number CRC0, Line Number CRC1". This "Line Number CRC0, Line

Number CRC1" may represent values of CRC (cyclic redundancy check codes) for 5 words ranging from "DID" to "Line Number-1", and may be used to check transmission errors.

"Code & AAI (Authorized address identifier)" may indicate information such as the setting of the word length of the payload portion ranging from the SAV to the EAV and the type of the data format of the addresses on the transmission side and the reception side.

"Destination Address" may be an address of the data reception side (destination) and "Source Address" may be an address of the data transmission side (source). "Block Type" which may follow "Source Address" may represent the type of the payload portion, e.g. whether the payload portion is of the fixed length type or the variable length type. When the payload portion is of the variable length type, compressed data may be inserted. In the SDTI-CP format, when the content item is generated by using compressed video data, for example, the data quantity may be changed depending upon every frame so that a variable length block (Variable Block) may be used. Therefore, "Block Type" of the SDTI-CP format may be set to fixed data 1C1h.

"CRC Flag" may be a flag used to indicate whether or not a CRC is located at the last two words of the payload portion PAD. Also, "Data extension flag" which may follow the "CRC Flag" may indicate whether or not the user data packet is extended.

The "Data extension flag" may be followed by a 4-word

"Reserved" area. The next "Header CRC 0, Header CRC 1" may represent values of CRC (cyclic redundancy check codes) for "Code & AAI" to "Reserved3", and may be used to check transmission errors. "Check Sum" may be a Check Sum code for all header data, and may be used to check transmission errors.

Next, the contents package inserted into the payload portion PAD of the video frame will further be described with reference to FIG. 3. FIG. 3 shows a fundamental arrangement of the contents package.

Each contents package may comprise up to four items, each of which may comprise one or more elements. These four items may be respective system item, picture item, audio item and ancillary data item.

Fundamentally, the picture and audio items may be stream elements which may be used to transport direct constituents of television. These two items may be frequently transmitted to an exclusively-used storage or processing device. Ancillary data may be used to transport contents mainly comprising data, such as sub-title or teletext data. The ancillary data may be frequently created on the computer, processed and then stored therein.

When a digital delivery service increases, it can be expected that the number, volume and complexity of ancillary data type will increase. Finally, the system item may provide services for package on the whole through package metadata like a time stamp, metadata for respective elements of other three items and downstream package control element.

Each of picture, audio and ancillary data items can comprise up to 255 elements, for example.

FIG. 1 shows a data structure obtained when the contents package comprising the four items of system item, picture item, audio item and ancillary data item is inserted into the payload portion of the video frame.

FIG. 4 shows the layout of the contents package using the example of GOP of the MPEG-2 (see hatched portions). A series of contents package may be generated by packaging each frame of encoded video data together with other data. Then, on the SDTI format, video data may be scanned from the first field to the second field of each frame rightwards and transferred. In this case, although video data of each frame is encoded to video data of different data quantity, the encoded video data of each frame may be transmitted in correspondence with each frame interval.

Incidentally, each contents package should contain the system item and may be completed by any of other items. The system item may be located at the leading portion in order to recognize the starting point of the contents package. Specifically, this system item may begin with the 13th line according to the NTSC system, and may begin with the 9th line according to the PAL system. Also, in one contents package, of the items of the above-mentioned four types, it is frequently observed that there may be only one type of item.

Each item may be arranged as an SDTI variable length block which may begin with "Separator" and end with "End Code" as shown in FIG. 5. The "Separator" may be started immediately after the start synchronizing code SAV. The value of "Separator" may be set to "309h", and the value of "End Code" may be set to "30Ah". "Word Count" may indicate the number of words of "Data Block", and the "Data Block" may be data of each item.

"Data Type" may be used to indicate the type of packaged data, i.e. type of item data. A value of "Data Type" may be set to "04h" when the packaged data is the system item, for example, may be set to "05h" when the packaged data is the picture item, may be set to "06h" when the packaged data is the audio item, and may be set to "07h" when the packaged data is the ancillary data item. The leading portion of the contents package may be detected by detecting "Data Type" code of the system item.

Incidentally, the input format of each SDTI variable length block may be 8-bit data of bits b0 to b7 comprising a part of 10-bit word. Bits b8 and b9 may both be set to "1" for "Separator" word and "End Code" word. For each word of "Data Type", "Word Count", "Data Block", in accordance with the SDTI format, the bit 8 may become an even parity of bits b0 to b7 and the bit b9 may become an odd parity.

FIG. 6 shows the arrangement of the system item. "System Item Type" and "Word Count" may be equivalent to "Data Type" and "Word

Count" of the above-mentioned variable length block, respectively. This system item may contain package metadata and control data as well as metadata for elements of the respective picture, audio and ancillary data items.

This system item may begin with a 7-word system item header which may be followed by an SMPTE universal label, time stamps, package, picture, audio and ancillary data metadata sets and further a control element.

The system item may comprise one-word "System Item Bitmap", one-word "Content Package Rate", one-word "Content Package Type" containing "stream status", 2-word "Channel Handle" and 2-word "Continuity Count".

The "System Item Bitmap" will be described. A bit b7 may be a flag which may indicate whether or not an error-correcting code is added to data. If this flag is held at "1", then it may be determined that the error-correcting code is added to data. A bit b6 may be a flag which may indicate whether or not the system item contains information of "SMPTE Universal Label". If this flag is held at "1", then it may be determined that the system item contains the information of "SMPTE Universal Label".

Bits b5 and b4 may be flags which may indicate whether or not the system item contains "Reference Date/Time stamp" and "Current Date/Time stamp". The "Reference Date/Time stamp" may indicate a time or a date at which a contents package, for example, was created first. The

"Current Date/Time stamp" may indicate a time or a date at which the contents package was corrected last.

A bit b3 may be a flag which may indicate whether or not the picture item follows this system item, a bit b2 may be a flag which may indicate whether or not the audio item follows this system item, and a bit b1 may indicate whether or not the ancillary data item follows this system item. If these flags are held at "1", then it can be determined that the respective items exist behind this system item.

A bit b0 may be a flag which may indicate whether or not this system item contains the control element. If this flag is held at "1", then it can be determined that the control element may exist within this system item. Incidentally, although not shown, bits b8, b9 may be added to the system item and thereby data may be transmitted as 10-bit data.

"Content Package Rate" will be described. Bits b7 to b6 may be used as a reserved area (Reserved), and bits b5 to b1 may indicate a package rate (Package Rate) which might be a package rate per second in the one-time normal speed operation mode. A bit b0 may be a 1.001 flag. If this flag is set to "1", then it can be determined that the package rate is 1/1.001 times the normal speed.

"Content Package Type" will be described. Bits b7 to b5 may be a "Stream Status" flag which may be used to discriminate the position of the picture unit within the stream. This 3-bit "Stream Status" flag may represent the following 8 kinds of the states.

0: This picture unit does not belong to any of a pre-roll (pre-roll) interval, an editing interval and a post-roll (post-roll) interval.

1: This picture unit is a picture contained in the pre-roll interval and which is followed by the editing interval.

2: This picture unit is the first picture unit of the editing interval.

3: This picture unit is the picture unit contained in the intermediate portion of the editing interval.

4: This picture unit is the last picture unit of the editing interval.

5: This picture unit is the picture unit contained in the post-roll interval.

6: This picture unit is the first and last picture unit of the editing interval (state in which there exists only one picture unit of the editing interval).

7: Reserved.

Also, a bit b4 may be used as a reserved area (Reserved). "Transfer Mode" of bits b3, b2 may indicate a transmission mode of a transmission packet. Also, "Timing Mode" of bits b1, b0 may indicate a timing mode. If the value represented by the bits b3, b2 is held at "0", then it can be determined that the transfer mode is a synchronous mode (Synchronous mode). If such value is held at "1", then it can be determined that the transfer mode is an isochronous mode (Isochronous

mode). If such value is held at "2", then it can be determined that the transfer mode may be an synchronous mode (Asynchronous mode). If the value represented by the bits b1, b0 is held at "0", then it can be determined that the timing mode may be a normal timing mode (Normal timing mode) in which the transmission of contents package of one frame is started at a timing of a predetermined line of the first field. If such value is held at "1", then it can be determined that the timing mode may be an advanced timing mode (Advanced timing mode) in which such transmission is started at a timing of a predetermined line of the second field. If such value is held at "2", then it can be determined that the timing mode may be a dual timing mode (Dual timing mode) in which such transmission may be started at a timing of predetermined lines of the first and second fields.

"Channel Handle" will be described. This "Channel Handle" word may be used to discriminate contents packages of respective programs when contents packages of a plurality of programs are multiplexed and then transmitted. The multiplexed contents packages can be separated at every program by discriminating the 16-bit value of this "Channel Handle" word.

"Continuity Count" will be described. The "Continuity Count" may be a 16-bit modulo counter. This counter may count data at every picture unit in the ascending order, and may count data independently in the respective streams. Therefore, when the stream is switched by a

stream switcher or the like, the values of this counter may become discontinuous, thereby making it possible to detect the switching point (editing point). Incidentally, since this counter is the 16-bit (2^{16} = 65536) modulo counter and may be very large as described above, there is the lowest probability that the values of the counter will agree with each other accidentally at the switching point in the two switched streams. Thus, it is possible to provide a sufficiently high accuracy for detecting the switching point in actual practice.

The "Continuity Count" will be followed by "SMPTE Universal Label", "Reference Date/Time stamp" and "Current Date/Time stamp" as set forth above. Further, these metadata sets will be followed by "Package Metadata Set", "Picture Metadata Set", "Audio Metadata Set" and "Auxiliary Metadata Set" in response to the packaged items to thereby indicate information of contents package such as a program title and information concerning packaged item of picture, audio or ancillary data. Incidentally, "Picture Metadata Set", "Audio Metadata Set" and "Auxiliary Metadata Set" may be provided if it can be determined by the "System Item Bitmap" flag that the corresponding item is contained in the contents package.

Further, these metadata sets can be followed by "Control Element". This "Control Element" may comprise 1-byte element type identifier and the following 4-byte word count and control element data.

The above-mentioned "Time stamp" will be further described. 17

bytes may be assigned to this "Time stamp". The first 1 byte may be used to discriminate "Time stamp", and the remaining 16 bytes may be used as a data area. The first 8 bytes of the data area may indicate the time code (Time-code) that is standardized as SMPTE12M, for example. The following 8 bytes may be invalid data.

FIG. 7 shows the arrangement of the time code that was standardized as the SMPTE-12M. This time code may comprise "Frame", "Seconds", "Minutes", "Hours" and a 4-byte "Binary Group Data".

"Frame" will be described. A bit b7 may be a color frame flag (Color Frame Flag). It can be determined by this color frame flag whether the color frame is the first color frame or the second color frame. A bit b6 may be a drop frame flag (Drop Frame Flag). It can be determined by this drop frame flag whether the video frame inserted into the picture item is the drop frame or not. Then, bits b5, b4 may represent the second digit of the frame, and bits b3 to b0 may represent the first digit of the frame.

"Seconds" will be described. A bit b7 may indicate a field phase (NTSC) or binary group 0 (PAL). Therefore, in the case of the NTSC system, it can be determined by this bit b7 whether the field is the first field or the second field. Then, bits b6 to b4 may represent the second digit of the second, and bits b3 to b0 may represent the first digit of the second.

"Minutes" will be described. A bit b7 may indicate a binary group 0 (NTSC) or a binary group 2 (PAL). Then, bits b6 to b4 may represent the second digit of the minute, and bits b3 to b0 may represent

the first digit of the minute.

"Hours" will be described. A bit b7 may indicate a binary group 1, and a bit b6 may indicate a binary group 2 (NTSC) or a field phase (PAL). Therefore, in the case of the PAL system, it can be determined by this bit b6 whether the field is the first field or the second field. Then, bits b5, b4 may represent the second digit of the hour, and bits b3 to b0 may represent the first digit of the hour.

Also, it may be determined by 3 bits B0 to B0 of the bit b7 of the above-mentioned "Minutes" and bit b7, b6 of "Hours" (3 bits FP, B0, B2 of bit b7 of "Seconds", "Minutes", "Hours" according to the PAL system) whether or not BG1 to BG8 of "Binary Group Data" contain data. This "Binary Group Data" is able to display the date in Gregorian Calendar (Gregorian Calender) and Julian Calendar (Julian Calender), for example, by two digits.

The above-mentioned "Metadata Set" will further be described. FIG. 8 shows the arrangement of "Metadata Set". "Metadata Set" may begin with 1-word "Metadata Count" which may define the number of words of "Metadata Block" within the set. A metadata count value of "00h" may be a valid value and may indicate the absence of "Metadata Block". In this case, "Metadata Set" may become only 1-word length.

FIG. 9A shows the arrangement of "Package Metadata Block". This "Package Metadata Block" may begin with 1-word "Metadata Type" which will be followed by a 2-word "Word Count" (FIG. 9C) and which will

be completed by "Metadata" itself. The "Metadata Type" word may indicate the type of "Metadata". "Word Count" may indicate the number of words up to the end of the block (equivalent to "Word Count" of variable length block).

FIG. 9B shows the arrangement of "Item Metadata Block". Similarly to the above-mentioned "Package Metadata Block", this "Item Metadata Block" may begin with 1-word "Metadata Type" which will be followed by a 2-word "Word Count" (FIG. 9C). Further, the 2-word word count will be followed by 1-word "Element Type" and 1-word "Element Number" and may end with "Metadata" itself. "Element Type" and "Element Number" may be information which are used to uniquely link associated elements of picture, audio and ancillary data items.

Next, the arrangements of the picture, audio and ancillary data items will be described. FIG. 10 shows the arrangements of these items. These items may begin with 1-word "Item Type" which will be followed by a 4-word "Word Count" and 1-word "Item Header" and which will be followed by "Element Data Block". "Item Type" may indicate the type of item as described above, and may be set to "05h" if the item type is the picture item, may be set to "06h" if the item type is the audio item, and may be set to "07h" if the item type is the ancillary data item. "Item Word Count" may indicate the number of words up to the end of this block (equivalent to "Word Count" of variable length block).

"Item Header" may indicate the number of words of "Element

Data Block". "Element Data Block" may be used as the item data area. Here, since "Item Header" may be 8 bits and indicate the number of words of "Element Data Block", the number of "Element Data Block" may fall within a range of from 1 to 255 (0 is not valid).

"Element Data Block" may begin with "Element Type" of one word, may be followed by a 4-word "Element Word Count" and 1-word "Element Number", and may end with "Element Data". "Element Type" and "Element Word Count" may indicate the type of data and the data quantity. "Element Word Count" may have the same format as that prescribed by the SMPTE-305M, and the value is "Element Data" word length in which "1" may be added to "Element Number". "Element Number" may indicate the order of "Element Data Block".

An MPEG-2 image element which may be one of elements will be described. The MPEG-2 image element may be MPEG-2 video elementary stream (V-ES) of any profile or level. The profile or level may be defined by a decoder template document.

FIG. 11 shows an example of a format of MPEG-2 V-ES in the SDTI-CP element frame. This example may be a V-ES bit stream example which may specify (in accordance with the SMPTE recommended practice) the key, i.e. MPEG-2 start code. The MPEG-2 V-ES bit stream may be simply formatted to the data block as shown in the figure.

Next, an 8-channel AES-3 element which may be one of elements will be described. Although this element may be inherently used

to transport non-compressed AES-3 audio data up to the 8 channels, it can transport compressed bit stream which was already encoded as the AES-3 signal and other non-audio data.

FIG. 12 shows the arrangement of the 8-channel AES-3 element. This element may comprise "Element Header", "Audio Sample Count", "Stream Valid Flags" and "AES-3 Data Area".

"Element Header" will be described. A bit b7 may be a "FVUCP Valid Flag" which may determine whether or not FVUCP defined in the AES-3 format standardized by AES (Audio Engineering Society) is set by audio data of AES-3 format of "Data Area". Bits b6 to b3 may be a reserved area (Reserved), and bits b2 to b0 may indicate the sequence number (5-sequence count) of the 5-frame sequence.

The 5-frame sequence will be described. When the audio signal synchronized with a video signal of (30/1.001) frame/second in the scanning line in which one frame may comprise 525 lines and whose sampling frequency is 48 kHz is divided into every block of each frame of a video signal, the number of samples per one video frame may become 1601.6 samples and may not become an integral value. Therefore, the sequence in which there are provided two frames of frame of 1601 samples and there are provided three frames of frame of 1602 samples so that 5 frames may provide 8008 samples may be called a 5-frame sequence.

FIG. 13 shows the 5-frame sequence. That is, in synchronism

with the reference frame, the frames of sequence numbers 1, 3, 5, for example, may be set to 1602 samples and the frames of sequence numbers 2, 4 may be set to 1601 samples. This sequence number may be indicated by bits b2 to b0 of the above-mentioned "Element Header".

"Audio Sample Count" will be described. This "Audio Sample Count" may be a 16-bit counter within a range of 0 to 65535 by using bits c15 to c0 and may indicate the number of samples of each channel. Incidentally, within the element, it may be assumed that all channels have the same value.

"Stream Valid Flags" will be described. The "Stream Valid Flags" may be used to indicate whether or not each stream of 8 channels is valid. If each channel contains meaningful audio data, then a bit corresponding to this channel may be set to "1" and other bits may be set to "0". There may be transmitted only audio data of channel in which a bit may be set to "0".

"AES-3 Data Area" will be described. "s2 to s0" of this "Data Area" may be a data area which may be used to discriminate each stream of 8 channels. "F" may indicate the start of the sub-frame. "a23 to a0" may indicate audio data, "P, C, U, V" may indicate channel status, user bit, Validity bit, parity or the like.

A general-purpose data format (General Data Format) will be described next. This general-purpose data format may be used to transport all free form data types. However, this free form data type does

not contain a special ancillary element type such as an IT nature (word processing file, hypertext, etc.).

The MPEG-2 image editing metadata which may be one of metadata will be described. This metadata may be a combination of editing and error metadata, compression-coded metadata and source-coded metadata. These metadata can be inserted into mainly the above-mentioned system items and further into the ancillary data item.

FIGS. 14A to C show "Picture Editing Bitmap" area, "Picture Coding" area and "MPEG User Bitmap" area provided within the MPEG-2 image editing metadata inserted into the "Picture Metadata Set" of the system item shown in FIG. 6, respectively. Further, it can be considered that "Profile/Level" area indicative of the profile and level of the MPEG-2 and video index information defined by the SMPTE186-1995 may be provided in this MPEG-2 image editing metadata.

FIG. 14A shows "Picture Editing Bitmap" of one word. Bits b7 and b6 may be "Edit flag" and may be a flag which indicates editing point information. This 2-bit flag may represent the following 4 kinds of the states.

00: No editing point;

01: The editing point is located ahead of a picture unit with this flag attached thereto (Pre-picture edit);

10: The editing point is located behind the picture unit with this flag attached thereto (Post-picture edit);

11: Only one picture unit is inserted and the editing point is located ahead of and behind the picture unit with this flag attached thereto (single frame picture).

That is, the flag which may indicate whether or not the video data (picture unit) inserted into the picture item is located ahead of the editing point, whether or not the video data is located behind the editing point and whether or not the video data is located between two editing points may be inserted into the "Picture Editing Bitmap" area of the "Picture Metadata Set" (see FIG. 6).

Bits b5 and b4 may be "Error flag". This "Error flag" may indicate whether or not the picture contains errors that cannot be corrected, whether or not the picture contains a conceal error, whether or not the picture does not contain errors and whether or not the picture is placed in the unknown state. A bit b3 may be a flag which may indicate whether or not "Picture Coding" is located in this "Picture Metadata Set" area. If this flag is held at "1", then it can be determined that "Picture Coding" is contained in the picture metadata set.

A bit b2 may be a flag which may indicate whether or not "Profile/Level" is contained in the metadata block. If this flag is held at "1", then it can be determined that "Profile/Level" is contained in the "Metadata Block". This "Profile/Level" may represent MP@ML, HP@HL or the like which may indicate the profile and level of MPEG.

A bit b1 may be a flag which may indicate whether or not "HV

Size" is contained in the metadata block. If this flag is held at "1", then it can be determined that "HV Size" is contained in the "Metadata Block". A bit b0 may be a flag which may indicate whether or not "MPEG User Bitmap" is contained in the metadata block. If this flag is held at "1", then it can be determined that "MPEG User Bitmap" is contained in the "Metadata Block".

FIG. 14B shows the arrangement of one-word "Picture Coding". A bit b7 may have "Closed GOP" provided therein. This "Closed GOP" may indicate whether or not GOP (Group Of Picture) obtained upon MPEG-compression is Closed GOP.

"Broken Link" may be assigned to a bit b6. This "Broken Link" may be a flag which may be used by the decoder side to control the reproduction. That is, although the respective pictures of MPEG are arranged in the sequential order of B picture, B picture, I picture ..., there is then the risk that when a different stream is connected to the stream due to the editing point, B picture of the switched stream, for example, will be decoded with reference to P picture of the stream which is not yet switched. If this flag is set, then it is possible to prevent the decoder side from executing the above-mentioned decoding.

"Picture Coding Type" may be assigned to bits b5 to b3. This "Picture Coding Type" may be a flag which may indicate whether the picture is the I picture, the B picture or the P picture. Bits b2 to b0 may be a reserved area (Reserved).

FIG. 14C shows the arrangement of one-word "MPEG User Bitmap". "History data" may be assigned to a bit b7. This "History data" may be a flag which may indicate whether or not encoded data such as quantization step, macro-type or motion vector required by the encoding of the previous generation is inserted into the user data area existing within "Metadata" as History data. "Anc data" may be assigned to a bit b6. This "Anc data" may be a flag which may indicate whether or not data inserted into the ancillary area (e.g. data necessary for MPEG compression, etc.) is inserted into the above-mentioned user data area as Anc data.

"Video index" may be assigned to a bit b5. This "Video index" may be a flag which may indicate whether or not Video index information is inserted into the Video index area. This Video index information may be inserted into a 15-byte Video index area. In this case, the insertion positions may be determined at every class of five classes (classes of 1.1, 1.2, 1.3, 1.4 and 1.5). Video index information of 1.1 class, for example, may be inserted into the first 3 bytes.

"Picture order" may be assigned to a bit b4. This "Picture order" may be a flag which may indicate whether or not the order of the respective picture in the MPEG stream is changed. Incidentally, the change of the order of the respective pictures in the MPEG stream may become necessary upon multiplexing.

"Timecode 2", "Timecode 1" may be assigned to bits b3, b2. The

"Timecode 2", "Timecode 1" may be flags which may indicate whether or not a VITC (Vertical Interval Time Code) and an LTC (Longitudinal Time Code) are inserted into the areas of the Timecode 2, 1. "H-Phase", "V-Phase" may be assigned to bits b1, b0. The "H-Phase", "V-Phase" may be flags which may indicate from which horizontal pixel and vertical line information may be encoded, i.e. frame information used in actual practice may exist in the user data area.

Next, audio editing metadata which may be one of metadata will be described. This metadata may be a combination of editing and error metadata and source-coded metadata. These metadata can be inserted into mainly the above-mentioned system item and further into the ancillary data item.

FIGS. 15A to D show "Field/Frame flags" area, "Audio Editing Bitmap" area, "CS Valid Bitmap" area and "Channel Status Data" area which may be provided within the audio editing metadata inserted into "Audio Metadata Set" area of the system item shown in FIG. 6, respectively.

Here, the number of valid audio channels can be discriminated by the above-mentioned "Stream Valid Flags" of FIG. 12. If "Stream Valid Flags" is held at "1", then "Audio Editing Bitmap" becomes valid.

FIG. 15A shows "Field/Frame flags" of one word. This flag may correspond to audio data of first to eight channels of bits b7 to b0. If this flag is held at "0", then it can be indicated that data is packed at the frame

unit. If this flag is held at "1", then it can be indicated that data is packed at the field unit.

FIG. 15B shows "Audio Editing Bitmap". "First edit flag" of bits b7, b6 may indicate information concerning the editing situation of the first field. "First edit flag" of bits b5, b4 may indicate information concerning the editing situation of the first field. Bits b3, b2 may be "Error flag". This "Error flag" may indicate whether or not errors that cannot be corrected occur. Bits b1, b0 may be a reserved area (Reserved).

FIG. 15C shows "CS Valid Bitmap" of one word. This "CS Valid Bitmap" may be a header of "Channel Status Data" of n (n = 6, 14, 18 or 22) bytes shown in FIG. 15D and indicate which channel status word of 24 channel status words exist within the data block. Here, "CS Valid1" of bit b7 may be a flag which may indicate whether or not data exists in a range of from 0 to 5 bytes of "Channel Status Data". Similarly, "CS Valid2" to "CS Valid4" of bits b6 to b4 may be flags which may indicate whether or not data exist in a range of from 6 to 13 bytes, 14 to 17 bytes and 18 to 21 bytes of "Channel Status Data".

Incidentally, "Channel Status Data" may be formed of 24-byte data. The 22-byte data at the second from the last may determine whether or not data exist in a range of from 0 to 21 bytes. The last 23-byte data may be assigned to a CRC.

FIG. 16 shows an example of a transmission system of a stream according to the above-mentioned SDTI-CP format (hereinafter referred to

as "SDTI-CP stream"). This transmission system 100 may comprise a storage device 101 formed of a VTR, a server or the like, an SDTI-CP interface 102 and an SDTI-CP stream switcher 103 located on a transmission line 104.

The storage device 101 may accumulate therein a plurality of contents packages. Each contents package may comprise a plurality of items such as the system item, the picture item, the audio item and the ancillary data item as described above. Contents packages sequentially outputted from the storage device 101 may be supplied to the SDTI-CP interface 102. The SDTI-CP interface 102 may insert each contents package into the transmission packet of each video frame of the SDTI format (see FIG. 1), and may transmit such transmission packet to the transmission line 104. Incidentally, when the transmission data (SDTI-CP stream) based on the SDTI-CP format is transmitted as described above, such transmission packet may be P/S-converted, encoded in transmission line and then transmitted as serial data having a transmission rate of 270 Mbps.

Also, the SDTI-CP stream transmitted from the transmission line 104 may be supplied to the SDTI-CP interface 102. The SDTI-CP interface 102 may receive this SDTI-CP stream, may extract each contents package from the payload portion of the transmission packet of each video frame, and may sequentially supply each extracted contents package to the storage device 101. The storage device 101 may

sequentially accumulate the contents packages, which may be sequentially transmitted from the SDTI-CP interface 102, in a recording medium.

Incidentally, the storage device 101 may accumulate MPEG video data and audio data and further metadata themselves instead of the contents package comprising the system item, the picture item, the audio item and the ancillary data item.

In this case, video data, audio data, metadata of every video frame, or the like may be outputted from the storage device 101 and may be supplied to the SDTI-CP interface 102. Then, the SDTI-CP interface 102 may generate the system item, the picture item, the audio item, the ancillary data item or the like from each data and may obtain the contents package of each video frame by packing them. Further, this interface may insert each contents package into the payload portion of the transmission packet of each video frame of the SDTI format, and may transmit such transmission packet to the transmission line 104.

Also, in this case, the SDTI-CP interface 102 which received the SDTI-CP stream from the transmission line 104 may extract each contents package from the payload portion of the transmission packet of each video frame, may further obtain the video data, the audio data, the metadata or the like from the system item, the picture item, the audio item, the ancillary data item or the like comprising such contents package, and may sequentially supply them to the storage device 101. The storage

device 101 may accumulate data such as the video data, the audio data and the audio data which are sequentially transmitted from the SDTI-CP interface 102.

The manner in which the contents package of each video frame accumulated in the storage device 101 or the data such as the video data, the audio data and the metadata of each frame will be reproduced so that images may be displayed and sounds may be outputted will be described next.

The storage device 102 may comprise a recording medium 151 for accumulating therein data, a decoding circuit 152 for generating a video signal for displaying an image and an audio signal for outputting sounds by processing accumulated data, a muting circuit 153 for muting the audio signal and a control section 154 for controlling operations of the whole of the device.

When an image is displayed and sounds are outputted, the accumulated data (contents package of each frame or data such as video data, audio data and metadata) may be read out from the recording medium 151 and may be supplied to the decoding circuit 152. The decoding circuit 152 may generate a video signal and an audio signal by effecting a processing such as a data expansion and a digital/analog conversion on the accumulated data. The video signal obtained from the decoding circuit 152 may be supplied to a monitor 161 and thereby an image may be displayed on the monitor 161. Also, the audio signal

obtained from the decoding circuit 152 may be supplied through the muting circuit 153 to a speaker 162 and thereby sounds may be emanated from the speaker 162.

As described above, "Metadata block" of the MPEG-2 image editing metadata comprising "Picture Metadata Set" of the system item (see FIG. 6) may contain the 1-byte "Picture Editing Bitmap", and the bits b7, b6 may be the flag which may indicate the editing point information (see FIG. 14A). Therefore, the decoding circuit 152 may extract 2-bit editing point information also shown in FIG. 18 at every picture unit. This editing point information may be supplied to the control section 154.

Here, as described above, "00" may indicate the state that there is provided no editing point, "01" may indicate the state that the editing point is located ahead of the picture unit with this flag attached thereto, "01" may indicate the state that the editing point is located behind the picture unit with this flag attached thereto and further "11" may indicate the state that the editing point is located ahead of and behind the picture unit with this flag attached thereto. Therefore, the control section 154 is able to detect the editing point from the editing point information from the decoding circuit 152 as shown in the figure.

Then, the control section 154 may control the muting circuit 153 in such a manner that the audio signal can be muted at the detected editing point. In this case, the muting circuit 153 may mute the audio signal based on the cross-fade fashion such that the audio level may

progressively decrease before the editing point, for example, and the audio level may become lowest, whereafter the audio level may progressively increase. Since the audio side may be muted at the editing point as described above, it is possible to prevent an unexpected large noise from being generated due to the occurrence of the audio gap.

Also, the SDTI-CP stream switcher 103 in the transmission system shown in FIG. 16 may be a matrix switcher. This stream switcher 103 may switch the SDTI-CP stream. This SDTI-CP stream may be switched during the vertical synchronizing (V-sync) interval, concretely, 10th line in the case of the NTSC525 system or the 6th line in the case of the PAL625 system. FIG. 19 shows the manner in which a stream STMb will be switched to the stream STMa at a time tsw. Such switching of the stream can achieve the same effects as those achieved when an encoded stream is edited if video data is encoded by the I picture of MPEG. Incidentally, FIG. 19 schematically shows only the picture items and the audio items within each video frame.

Even when the stream may be switched by the above-mentioned stream switcher 103 as described above, there still remains the risk that the above-mentioned audio gap will occur. Therefore, when the SDTI-CP interface 102 receives the SDTI-CP stream in which the stream was switched, this interface may detect the switching point as the editing point and may correct the flag which may indicate the editing point information within the above-mentioned "Picture Editing Bitmap".

As described above, the system item (see FIG. 6) may include "Continuity Count" word which may count the independent stream at every picture unit in the ascending order. When the stream is switched by the stream switcher 103, the values of this counter may become discontinuous. As shown in FIG. 20, for example, when a stream STMc is generated by switching the stream STMa and the stream STMb at the time tsw, as illustrated, a discontinuity occurs in the value (count value) of "Continuity Count" of the stream STMc at the switching point.

The manner in which the flag indicative of the editing point information in the SDTI-CP interface 102 may be corrected will be described next.

As shown in FIG. 21, the SDTI-CP interface 102 may comprise a reception section 171 for receiving the SDTI-CP stream from the transmission line 104 (not shown in FIG. 21), an extraction section 172 for extracting the contents package from the transmission packet (see FIG. 1) of every video frame of the SDTI-CP stream received at this reception section 171, a detection section 173 for detecting "Continuity Count" from the system item comprising each contents package thus extracted, a detection section 174 for detecting a discontinuity of the value of its "Continuity Count" and a correction section 175 for supplying the contents package thus extracted by the extraction section 172 after the flag indicative of the editing point information within "Picture Editing Bitmap" in "Metadata block" of the MPEG-2 image editing metadata

contained in the system item was corrected on the basis of the detected result of the detection section 174.

The SDTI-CP stream received at the reception section 171 may be supplied to the extraction section 172 and thereby the contents package is extracted from the transmission packet of every video frame. Each contents package thus extracted may be supplied to the correction section 175. When the detection section 174 detects the discontinuity of the value of "Continuity Count", the correction section 175 may correct the bits b7, b6 within "Picture Editing Bitmap" based on the detected output.

That is, when the discontinuity of the value of "Continuity Count" is detected, this may mean that the switching point exists between the picture unit and the preceding picture unit. Accordingly, such switching point may be used as the editing point, and the bits b7, b6 within "Picture Editing Bitmap" at the picture unit can be corrected. For example, the bits b7, b6 in the picture unit ahead of the switching point may be corrected from "00" to "10", and the bits b7, b6 in the picture unit behind the switching point can be corrected from "00" to "01".

The contents package containing the system item in which the bits b7, b6 within "Picture Editing Bitmap" were corrected by the correction section 175 may be supplied to and accumulated in the storage device 101. Thus, the storage device 101 may handle the switching point also in the stream switcher 103 as the editing point. Therefore, in the

reproducing system, for example, the audio signal may be muted at the switching point as described above. Also, when data is outputted from the storage device and the next transmission is executed, data may be transmitted on the assumption that the above-mentioned switching point is the editing point.

Incidentally, while the picture unit is the frame unit in the above-mentioned embodiment, the picture unit is not limited thereto, and this invention can be similarly applied to the case in which the picture unit is the field unit or other units.

As set forth above, according to this invention, the first data containing the extension data having the editing point information at the picture unit of the video data and the second data containing the main data comprising the video data and/or audio data may be inserted into the payload area. Therefore, the reception side can detect by effectively utilizing the editing point information the editing point at which the audio gap will occur as described above. Thus, it is possible to effect the necessary processing such as muting of sounds on the editing point.

Also, according to this invention, the first data containing the extension data having data of the count value counted at the picture unit of the video data at every picture unit and the second data containing the main data comprising the video data and/or audio data are inserted into the payload area. When the stream is switched by the router switch (matrix switch), for example, in the transmission line, the count value

becomes discontinuous. Therefore, the reception side can detect the switching point as the editing point by the discontinuity of the count value, for example, and is able to effect the necessary processing such as muting of sounds on the editing point.

INDUSTRIAL APPLICABILITY

As described above, the data transmission method and apparatus, the data reception method and apparatus, and the sound reproduction method and apparatus according to this invention are for use with a television conference system, a visual telephone system, a broadcasting device or the like for transmitting a moving picture signal and an audio signal or the like from the transmission side to the reception side through the transmission line.

CLAIMS

1. A data transmission method for transmitting a serial digital transfer interface transmission packet in which an interval of each line of a video frame comprises an end synchronizing code area into which an end synchronizing code is inserted, an ancillary data area into which ancillary data is inserted, a start synchronizing code area into which a start synchronizing code is inserted and a payload area into which main data comprising video data and/or audio data is inserted, said data transmission method comprising:

a first step of inserting into said payload area first data containing extension data having editing point information at the picture unit of said video data and second data containing said main data; and

a second step of transmitting said transmission packet in which said first data and said second data have been inserted into said payload area at the first step in the form of serial data.

2. The data transmission method as claimed in claim 1, wherein said editing point information uses said picture unit having said editing point information as an object picture unit and indicates whether or not said object picture unit is unrelated to an editing point, whether or not said editing point is located ahead of said object picture unit, whether or not said editing point is located behind said object picture unit and

whether or not said editing point is located ahead of and behind said object picture unit.

3. The data transmission method for transmitting a serial digital transfer interface transmission packet in which an interval of each line of a video frame comprises an end synchronizing code area into which an end synchronizing code is inserted, an ancillary data area into which ancillary data is inserted, a start synchronizing code area into which a start synchronizing code is inserted and a payload area into which main data comprising video data and/or audio data is inserted, said data transmission method comprising:

a first step of inserting into said payload area first data containing extension data having data of a count value counted at the picture unit of said video data at every picture unit and second data containing said main data; and

a second step of transmitting said transmission packet in which said first data and said second data have been inserted into said payload area at said first step in the form of serial data.

4. The data transmission method as claimed in claim 3, wherein the area within said payload area into which the data of said count value is inserted is located near said start synchronizing code area.

5. The data reception method for receiving a serial digital transfer interface transmission packet in which an interval of each line of a video frame comprises an end synchronizing code area into which an end synchronizing code is inserted, an ancillary data area into which ancillary data is inserted, a start synchronizing code area into which a start synchronizing code is inserted and a payload area into which first data containing main data comprising video data and/or audio data and second data containing extension data having editing point information at the picture unit of said video data are inserted, said data reception method comprising:

a first step of receiving said transmission packet;

a second step of extracting said main data and said extension data from said transmission packet received at said first step; and

a third step of transferring to a recording apparatus at least said editing point information within said extension data extracted at said second step and said main data extracted at said second step.

6. The data reception method as claimed in claim 5, wherein said editing point information uses said picture unit having said editing point information as an object picture unit and indicates whether or not said object picture unit is unrelated to an editing point, whether or not said editing point is located ahead of said object picture unit, whether or not said editing point is located behind said object picture unit and

whether or not said editing point is located ahead of and behind said object picture unit.

7. The sound output method of outputting sounds based on audio data extracted from a serial digital transfer interface transmission packet in which an interval of each line of a video frame comprises an end synchronizing code area into which an end synchronizing code is inserted, an ancillary data area into which ancillary data is inserted, a start synchronizing code area into which a start synchronizing code is inserted and a payload area into which first data containing main data comprising video data and/or audio data and second data containing extension data having editing point information at the picture unit of said video data are inserted, said sound output method comprising:

a first step of outputting sounds based on audio data within said main data extracted from said transmission packet;

a second step of detecting an editing point from said editing point information within said extension data extracted from said transmission packet; and

a third step of muting sounds outputted at said first step in correspondence with an editing point detected at said second step.

8. The sound output method as claimed in claim 7, wherein said editing point information uses said picture unit having said editing

point information as an object picture unit and indicates whether or not said object picture unit is unrelated to an editing point, whether or not said editing point is located ahead of said editing point, whether or not said editing point is located behind said object picture unit and whether or not said editing point is located ahead of and behind said object picture unit.

9. A data reception method of receiving a serial digital transfer interface transmission packet in which an interval of each line of a video frame comprises an end synchronizing code area into which an end synchronizing code is inserted, an ancillary data area into which ancillary data is inserted, a start synchronizing code area into which a start synchronizing code is inserted and a payload area into which first data containing main data comprising video data and/or audio data and second data containing data of a count value counted at the picture unit of said video data at every picture unit and extension data having editing point information are inserted, said data reception method comprising:

a first step of receiving said transmission packet;

a second step of extracting said main data and said extension data from said transmission packet received at said first step;

a third step of detecting an editing point from a discontinuity of the data of said count value within said extension data extracted at said second step; and

a fourth step of correcting said editing point information within said extension data extracted at said second step in correspondence with said editing point detected at said third step.

10. The data reception method as claimed in claim 9, wherein said editing point information uses said picture unit having said editing point information as an object picture unit and indicates whether or not said object picture unit is unrelated to an editing point, whether or not said editing point is located ahead of said object picture unit, whether or not said editing point is located behind said object picture unit and whether or not said editing point is located ahead and behind said object picture unit.

11. The data reception method as claimed in claim 9, wherein the area within said payload area into which the data of said count value is inserted is located near said start synchronizing code area.

12. A data transmission apparatus for transmitting a serial digital transfer interface transmission packet in which an interval of each line of a video frame comprises an end synchronizing code area into which an end synchronizing code is inserted, an ancillary data area into which ancillary data is inserted, a start synchronizing code area into which a start synchronizing code is inserted and a payload area in which main

data comprising video data and/or audio data is inserted, said data transmission apparatus comprising:

means for inserting into said payload area first data containing extension data having editing point information at the picture unit of said video data and second data containing said main data; and

means for transmitting said transmission packet in which said first data and said second data have been inserted into said payload area in the form of serial data.

13. The data transmission apparatus as claimed in claim 12, wherein said editing point information uses said picture unit having said editing point information as an object picture unit and indicates whether or not said object picture unit is unrelated to an editing point, whether or not said editing point is located ahead of said object picture unit, whether or not said editing point is located behind said object picture unit and whether or not said editing point is located ahead of and behind said object picture unit.

14. A data transmission apparatus for transmitting a serial digital transfer interface transmission packet in which an interval of each line of a video frame comprises an end synchronizing code area into which an end synchronizing code is inserted, an ancillary data area into which ancillary data is inserted, a start synchronizing code area into which a

start synchronizing code is inserted and a payload area into which main data comprising video data and/or audio data is inserted, said data transmission apparatus comprising:

means for inserting into said payload area first data containing extension data having data of a count value counted at the picture unit of said video data at every picture unit and second data containing said main data; and

means for transmitting said transmission packet in which said first data and said second data have been inserted into said payload area in the form of serial data.

15. A data reception apparatus for receiving a serial digital transfer interface transmission packet in which an interval of each line of a video frame comprises an end synchronizing code area into which an end synchronizing code is inserted, an ancillary data area into which ancillary data is inserted, a start synchronizing code area into which a start synchronizing code is inserted and a payload area into which first data containing main data comprising video data and/or audio data and second data containing extension data having editing point information at the picture unit of said video data are inserted, said data reception apparatus comprising:

means for receiving said transmission packet;

means for extracting said main data and said extension data

from said received transmission packet; and

means for transferring to a recording apparatus at least said editing point information within said extension data extracted from said transmission packet and said main data extracted from said transmission packet.

16. The data reception apparatus as claimed in claim 15, wherein said editing point information uses said picture unit having said editing point information as an object picture unit and indicates whether or not said object picture unit is unrelated to an editing point, whether or not said editing point is located ahead of said object picture unit, whether or not said editing point is located behind said object picture unit and whether or not said editing point is located ahead of and behind said object picture unit.

17. A sound output apparatus for outputting sounds based on said audio data extracted from a serial digital transfer interface transmission packet in which an interval of each line of a video frame comprises an end synchronizing code area into which an end synchronizing code is inserted, an ancillary data area into which ancillary data is inserted, a start synchronizing code area into which a start synchronizing code is inserted and a payload area into which first data containing main data comprising video data and/or audio data and

second data containing extension data having editing point information at the picture unit of said video data, said sound output apparatus comprising:

means for outputting sounds based on audio data within said main data extracted from said transmission packet;

means for detecting an editing point from said editing point information within said extension data extracted from said transmission packet; and

means for muting said outputted sounds in correspondence with said detected editing point.

18. The sound output apparatus as claimed in claim 17, wherein said editing point information uses said picture unit having said editing point information as an object picture unit and indicates whether or not said editing point information is unrelated to an editing point, whether or not said editing point is located ahead of said object picture unit, whether or not said editing point is located behind said object picture unit and whether or not said editing point is located ahead of and behind said object picture unit.

19. The data reception apparatus for receiving a serial digital transfer interface transmission packet in which an interval of each line of a video frame comprises an end synchronizing code area into which an

end synchronizing code is inserted, an ancillary data area into which ancillary data is inserted, a start synchronizing code area into which a start synchronizing code is inserted and a payload area into which first data containing main data comprising video data and/or audio data and second data containing data of a count value counted at the picture unit of said video data at every picture unit and extension data having editing point information are inserted, said data reception apparatus comprising:

means for receiving said transmission packet;

means for extracting said main data and said extension data from said received transmission packet;

means for detecting an editing point from a discontinuity of the data of said count value within said extension data extracted from said transmission packet; and

means for correcting said editing point information within said extension data extracted from said transmission packet in correspondence with said detected editing point.

20. The data reception apparatus as claimed in claim 19, wherein said editing point information uses said picture unit having said editing point information as an object picture unit and indicates whether or not said object picture unit is unrelated to an editing point, whether or not said editing point is located ahead of said object picture unit, whether or not said object picture unit is located behind said object picture unit

and whether or not said editing point is located ahead of and behind said object picture unit.

ABSTRACT OF THE DISCLOSURE

This invention relates to a data transmission method or the like suitable for transmitting video data, audio data or the like. There is transmitted a serial digital transfer interface transmission packet in which an interval of each line of a video frame comprises an end synchronizing code area into which an end synchronizing code is inserted, an ancillary data area into which ancillary data is inserted, a start synchronizing code area into which a start synchronizing code is inserted and a payload area. The payload area has inserted thereto first data containing extension data having editing point information at the picture unit of video data and second data containing main data comprising video data and/or audio data. The reception side is able to effect a necessary processing such as muting of sounds on the editing point by effectively utilizing editing point information.

09/719696

FIG. 1

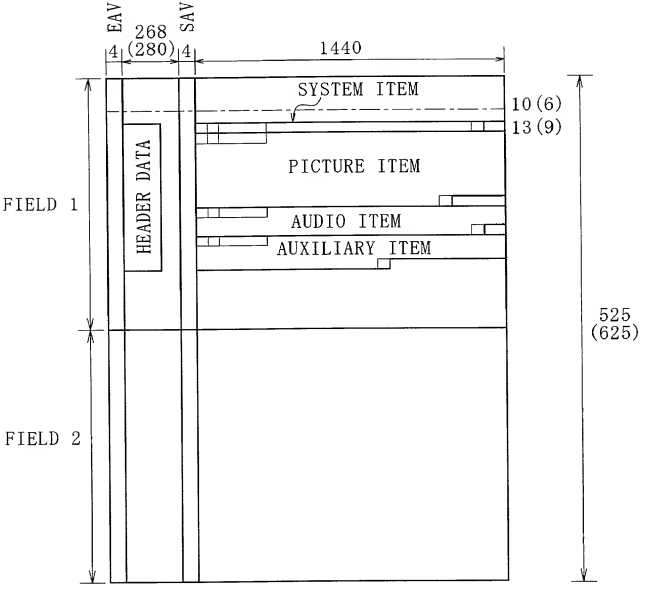

FIG. 2

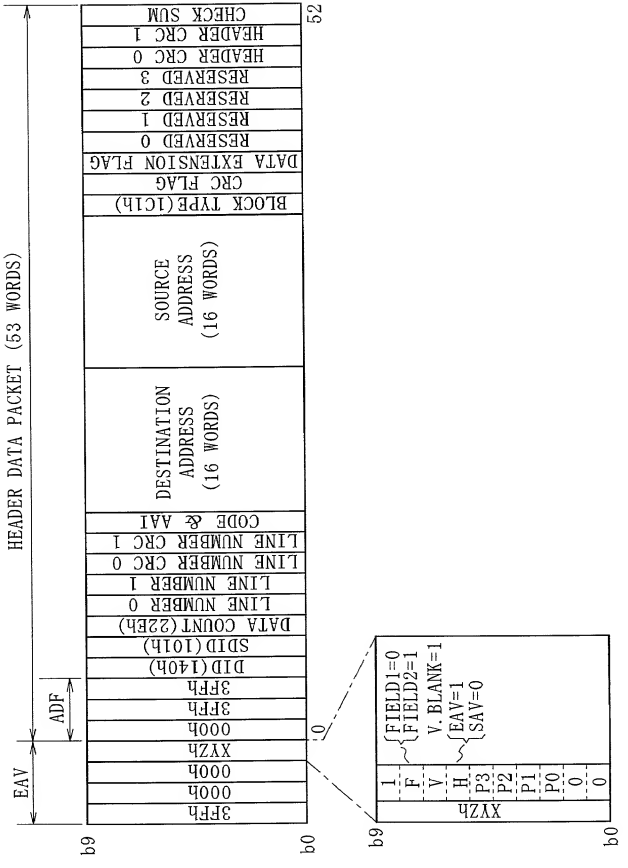
HEADER DATA PACKET (53 WORDS)
EAV
ADF
3FFh
000h
000h
XYZh
000h
3FFh
3FFh
DID (140h)
SDID (101h)
DATA COUNT (22Eh)
LINE NUMBER 0
LINE NUMBER 1
LINE NUMBER CRC 0
LINE NUMBER CRC 1
CODE & ANI
DESTINATION ADDRESS (16 WORDS)
SOURCE ADDRESS (16 WORDS)
BLOCK TYPE (1C1h)
CRC FLAG
DATA EXTENSION FLAG
RESERVED 0
RESERVED 1
RESERVED 2
RESERVED 3
HEADER CRC 0
HEADER CRC 1
CHECK SUM
52
b9
b0
FIELD1=0
FIELD2=1
V. BLANK=1
EAV=1
SAV=0
XYZh
F
V
H
P3
P2
P1
P0

FIG. 3

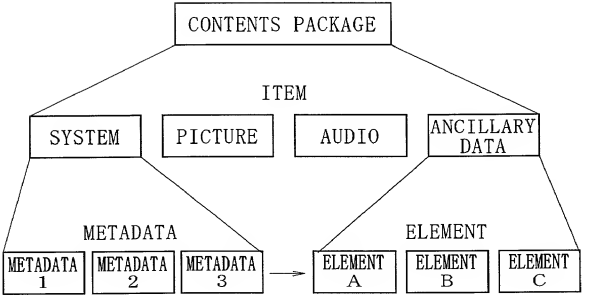
CONTENTS PACKAGE
ITEM
SYSTEM
PICTURE
AUDIO
ANCILLARY DATA
METADATA
ELEMENT
METADATA 1
METADATA 2
METADATA 3
ELEMENT A
ELEMENT B
ELEMENT C

FIG. 5

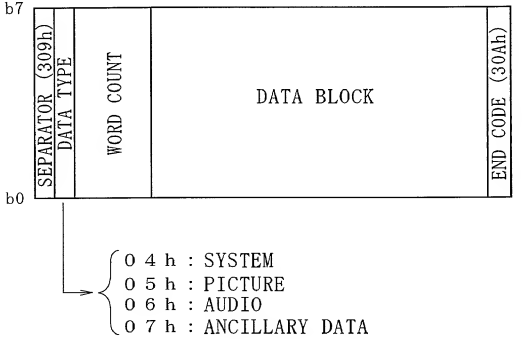
b7
b0
SEPARATOR (309h)
DATA TYPE
WORD COUNT
DATA BLOCK
END CODE (30Ah)
04h : SYSTEM
05h : PICTURE
06h : AUDIO
07h : ANCILLARY DATA

FIG. 4

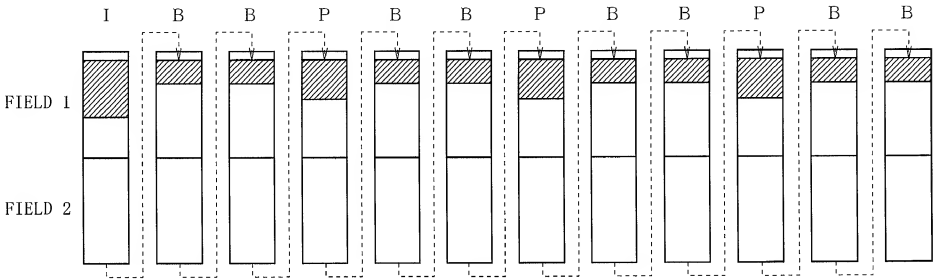

FIG. 6

SEPARATOR
ITEM TYPE (SYSTEM)
WORD COUNT
SYSTEM ITEM BITMAP
CONTENT PACKAGE RATE
CONTENT PACKAGE TYPE
CHANNEL HANDLE
CONTINUITY COUNT
SMPTE UNIVERSAL LABEL
REFERENCE DATE/TIME STAMP
CURRENT DATE/TIME STAMP
PACKAGE METADATA SET
PICTURE METADATA SET
AUDIO METADATA SET
AUXILIARY METADATA SET
CONTROL ELEMENT
END CODE
SYSTEM ITEM BITMAP
b7 FEC ACTIVE FLAG
b6 SMPTE LABEL
b5 REF DATE/TIME
b4 CURRENT DATE/TIME
b3 PICTURE
b2 AUDIO
b1 AUXILIARY
b0 CONTROL
CONTENT PACKAGE RATE
b7 RESERVED
b6
b5
b4 PACKAGE RATE
b3
b2
b1
b0 1.001 FLAG
CONTENT PACKAGE RATE
b7 STREAM STATUS
b6
b5
b4 RESERVED
b3 TRANSFER MODE
b2
b1 TIMING MODE
b0
H7 H15
H6 H14
H5 H13
H4 H12
H3 H11
H2 H10
H1 H9
H0 H8
C7 C15
C6 C14
C5 C13
C4 C12
C3 C11
C2 C10
C1 C9
C0 C8

FIG. 7

1
FRAME
b7 CF FLAG
b6 DF FLAG
b5 TENS
b4
b3
b2 UNITS
b1
b0
2
SECONDS
b7 FP
b6
b5 TENS
b4
b3
b2 UNITS
b1
b0
3
MINUTES
b7 B0
b6
b5 TENS
b4
b3
b2 UNITS
b1
b0
4
HOURS
b7 B2
b6 B1
b5 TENS
b4
b3
b2 UNITS
b1
b0
5
BINARY GROUP DATA
b7
b6 BG2
b5
b4
b3
b2 BG1
b1
b0
6
BINARY GROUP DATA
b7
b6 BG4
b5
b4
b3
b2 BG3
b1
b0
7
BINARY GROUP DATA
b7
b6 BG6
b5
b4
b3
b2 BG5
b1
b0
8
BINARY GROUP DATA
b7
b6 BG8
b5
b4
b3
b2 BG7
b1
b0

FIG. 8

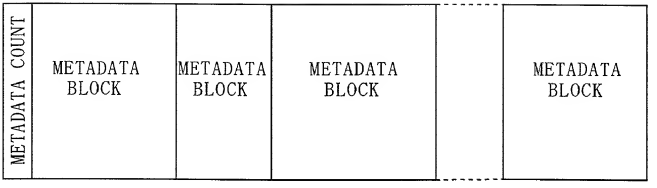

FIG. 9A

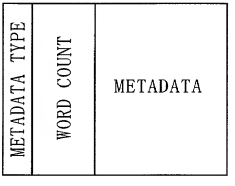

FIG. 9B

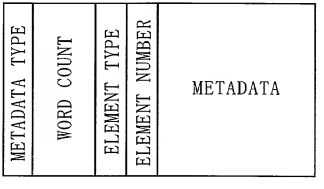

FIG. 9C

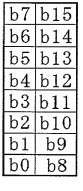

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FIG. 10

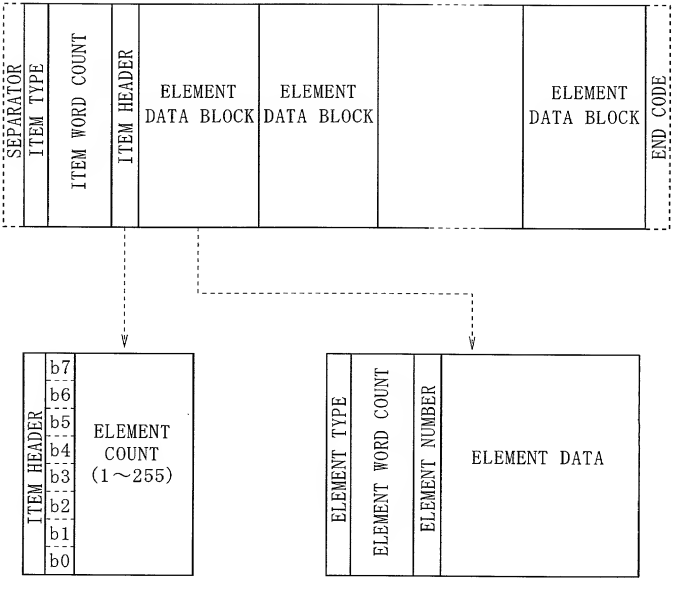

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FIG. 11

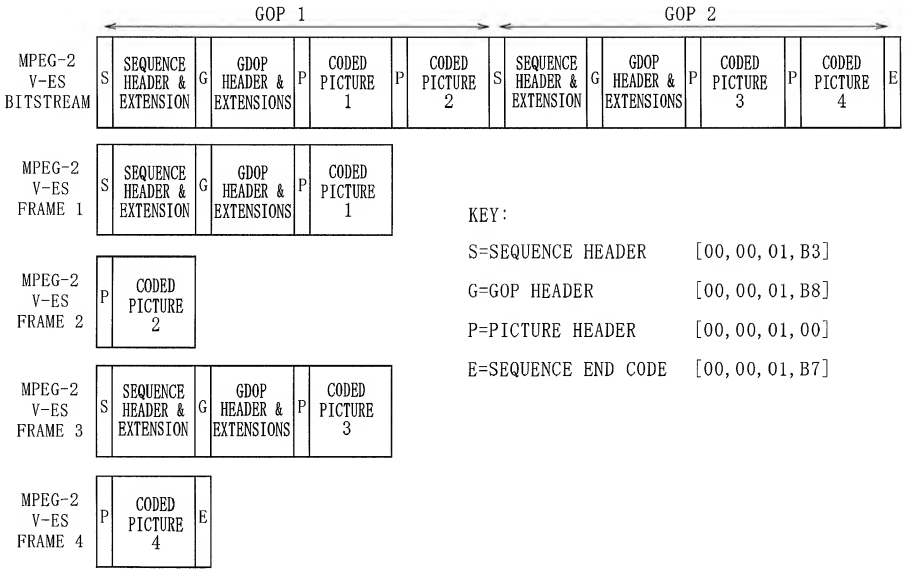

FIG. 12

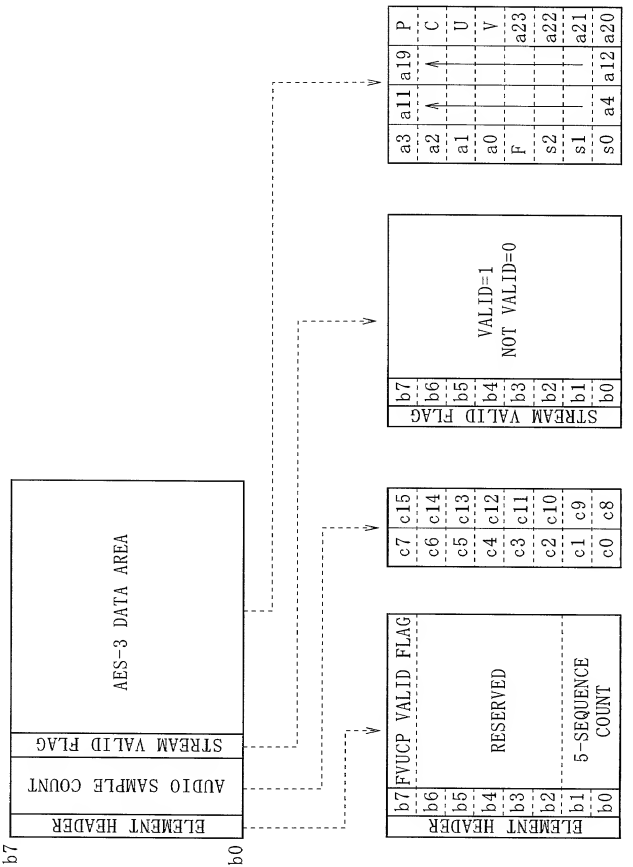
b7
b0
ELEMENT HEADER
AUDIO SAMPLE COUNT
STREAM VALID FLAG
AES-3 DATA AREA
ELEMENT HEADER
b7 FVUCP VALID FLAG
b6
b5
b4 RESERVED
b3
b2
b1 5-SEQUENCE COUNT
b0
c7 c15
c6 c14
c5 c13
c4 c12
c3 c11
c2 c10
c1 c9
c0 c8
STREAM VALID FLAG
b7
b6
b5
b4 VALID=1 NOT VALID=0
b3
b2
b1
b0
a3 a11 a19 P
a2 C
a1 U
a0 V
F a23
s2 a22
s1 a21
s0 a4 a12 a20

FIG. 13

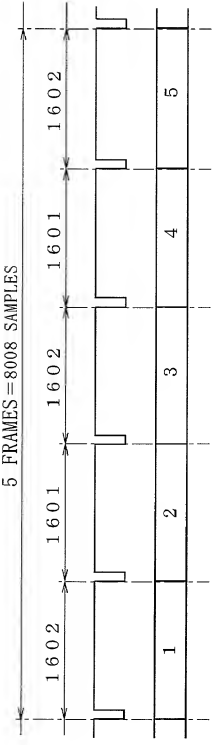
5 FRAMES=8008 SAMPLES
1602
1601
1602
1601
1602
REFERENCE FRAME SIGNAL
SEQUENCE NUMBER
1
2
3
4
5

FIG. 14A

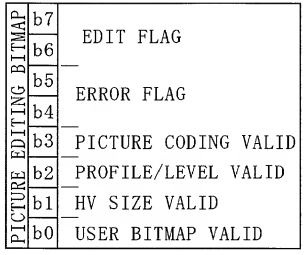

FIG. 14B

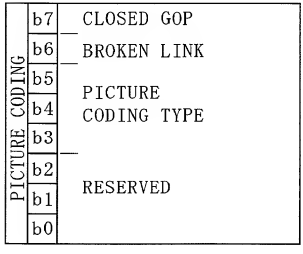

FIG. 14C

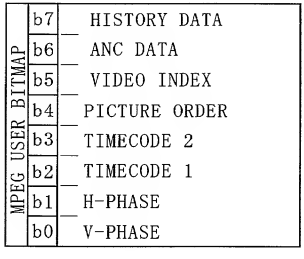

FIG. 15A

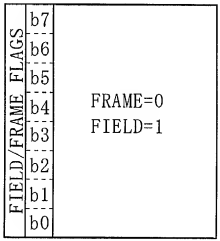

FIG. 15B

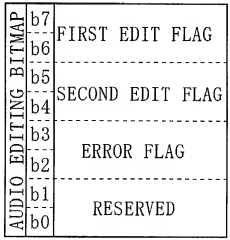

FIG. 15C

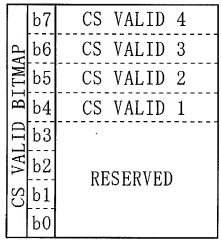

FIG. 15D

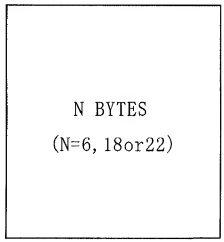

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FIG. 16

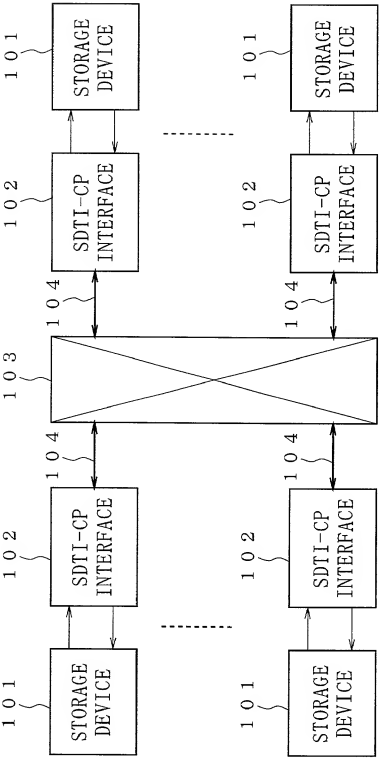


FIG. 17

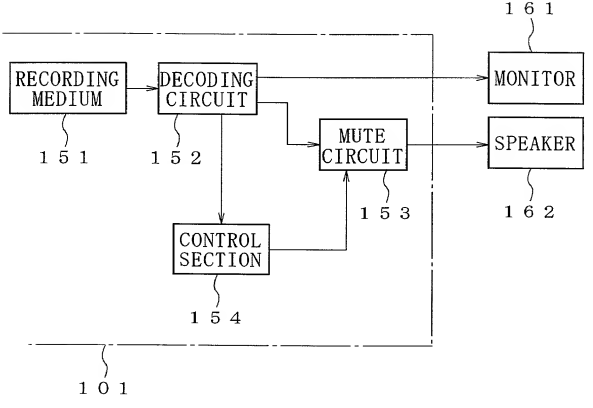

161
RECORDING MEDIUM
DECODING CIRCUIT
MONITOR
MUTE CIRCUIT
SPEAKER
151
152
153
162
CONTROL SECTION
154
101

FIG. 18

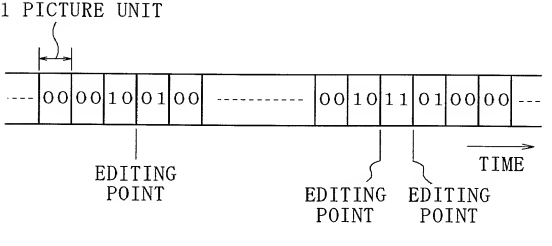
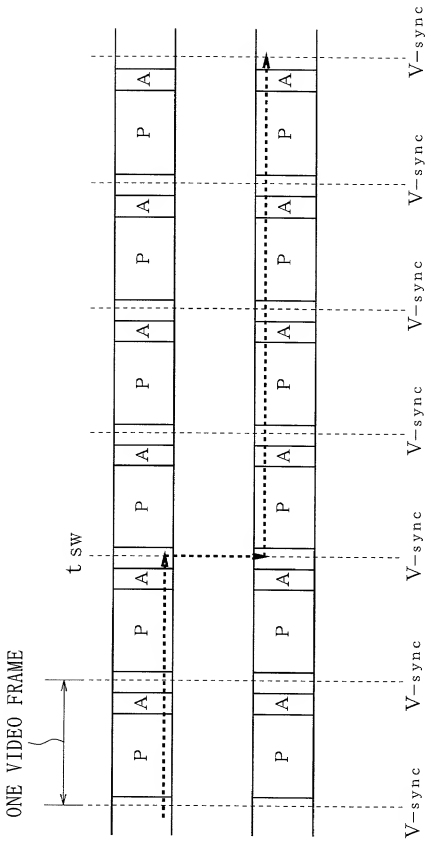
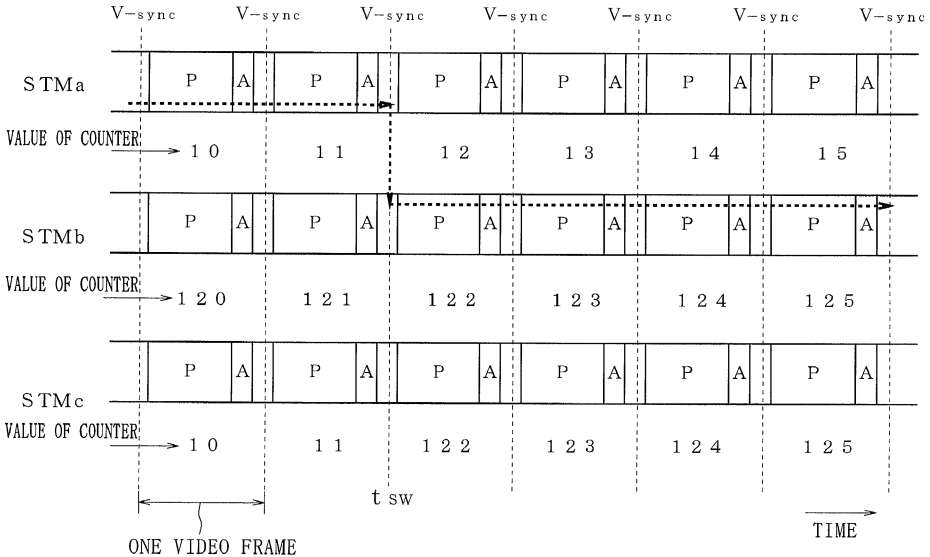

1 PICTURE UNIT
00 00 10 01 00
00 10 11 01 00 00
TIME
EDITING POINT
EDITING POINT
EDITING POINT

FIG. 19



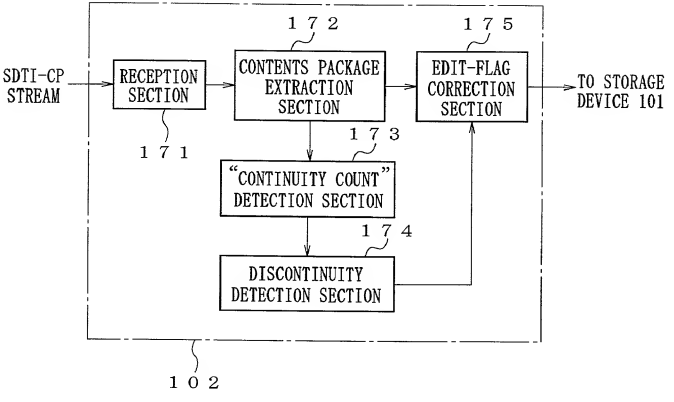
EPO - DG 1

FIG. 20



09/719696

FIG. 21


SDTI-CP STREAM
RECEPTION SECTION
171
CONTENTS PACKAGE EXTRACTION SECTION
172
"CONTINUITY COUNT" DETECTION SECTION
173
DISCONTINUITY DETECTION SECTION
174
EDIT-FLAG CORRECTION SECTION
175
TO STORAGE DEVICE 101
102

DRAFT 09/71956

8008 SAMPLES

	1602	1601	1602	1601	1602
	FIRST FRAME	SECOND FRAME	THIRD FRAME	FOURTH FRAME	FIFTH FRAME
FIG. 22A (STMa)					
FIG. 22B (STMb)	1(1602)	2(1601)	3(1602)	4(1601)	5(1602)
FIG. 22C (STMb)	5(1602)	1(1602)	2(1601)	3(1602)	4(1601)
FIG. 22D (STMb)	4(1601)	5(1602)	1(1602)	2(1601)	3(1602)
FIG. 22E (STMb)	3(1602)	4(1601)	5(1602)	1(1602)	2(1601)
FIG. 22F (STMb)	2(1601)	3(1602)	4(1601)	5(1602)	1(1602)

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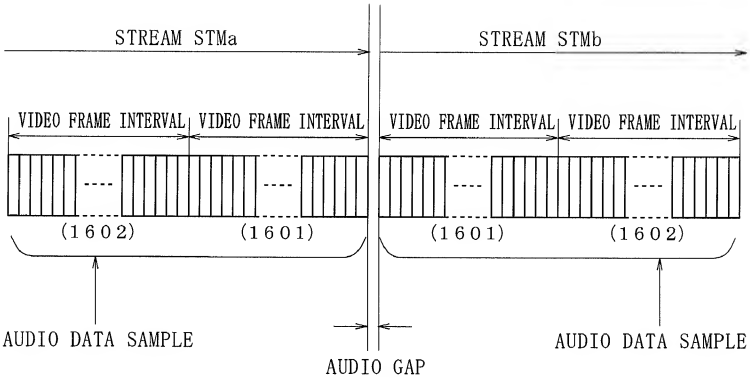
FIG. 23



S99P1105 U.S.PTO

PTO/SB 106 (5-00)
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Declaration and Power of Attorney for Patent Application

特許出願宣言書及び委任状

Japanese Language Declaration

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私は、以下に記名された発明者として、ここに下記の通り宣言する：

As a below named inventor, I hereby declare that:

私の住所、郵便の宛先そして国籍は、私の氏名の後に記載された通りである。

My residence, post office address and citizenship are as stated next to my name:

下記の名称の発明について、特許請求範囲に記載され、且つ特許が求められている発明主題に関して、私は、最初、最先且つ唯一の発明者である（唯一の氏名が記載されている場合）か、或いは最初、最先且つ共同発明者である（複数の氏名が記載されている場合）と信じている。

I believe I am the original, first and sole inventor if only one name is listed below) or an original, first and joint inventor (if plural names are listed below) of the subject matter which is claimed and for which a patent is sought on the invention entitled.

DATA TRANSMISSION METHOD AND DATA TRANSMISSION APPARATUS

上記発明の明細書はここに添付されているが、下記の箱がチェックされている場合は、この限りでない：

the specification of which is attached hereto unless the following box is checked:

☐ _____ の日に出願され、
この出願の米国出願番号またはＰＣＴ国際出願番号は、
_____ であり、且つ
_____ の日に補正された出願（該当する場合）

☒ was filed on 16 April 1999
as United States Application Number of
PCT International Application Number PCT/JP99/02042
_____ and was amended on
_____ (if applicable).

私は、上記の補正書によって補正された、特許請求範囲を含む上記明細書を検討し、且つ内容を理解していることをここに表明する。

I hereby state that I have reviewed and understand the contents of the above identified specification, including the claims, as amended by any amendment referred to above.

私は、連邦規則法典第３７編規則１．５６に定義されている、特許性について重要な情報を開示する義務があることを認める。

I acknowledge the duty to disclose information which is material to patentability as defined in Title 37, Code of Federal Regulations, Section 1.56.

Burden Hour Statement: This form is estimated to take 0.4 hours to complete. Time will vary depending upon the need of the individual case. Any comments on the amount of time you are required to complete this form should be sent to Chief Information Officer, U.S. Patent and Trademark Office, Washington, DC 20231. DO NOT SEND FEES OR COMPLETED FORMS TO THIS ADDRESS. SEND TO: Commissioner of Patents and Trademarks, Washington, DC 20231.

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私は、ここに、以下に記載した外国での特許出願または発明者証の出願、或いは米国以外の少なくとも一国を指定している米国法典第３５編第３６５条(a)によるＰＣＴ国際出願について、同第１１９条(a)-(d)項又は第３６５条(b)項に基づいて優先権を主張するとともに、優先権を主張する本出願の出願日よりも前の出願日を有する外国での特許出願または発明者証の出願、或いはＰＣＴ国際出願については、いかなる出願も、下記の枠内をチェックすることにより示した。

Prior Foreign Application(s)

外国での先行出願

PCT/JP99/02042	PCT	☐
(Number) (番号)	(Country) (国名)	16 April 1999 (Day/Month/Year Filed)
(Number) (番号)	(Country) (国名)	(Day/Month/Year Filed) ☐
(Number) (番号)	(Country) (国名)	(Day/Month/Year Filed) ☐
(Number) (番号)	(Country) (国名)	(Day/Month/Year Filed) ☐
(Number) (番号)	(Country) (国名)	(Day/Month/Year Filed) ☐
(Number) (番号)	(Country) (国名)	(Day/Month/Year Filed) ☐

Priority Not Claimed
優先権主張なし

I hereby claim foreign priority under Title 35, United States Code, Section 119(a)-(d) or 365(b) of any foreign application(s) for patent or inventor's certificate, or 365(a) of any PCT International application which designated at least one country other than the United States listed below and have also identified below, by checking the box, any foreign application for patent or inventor's certificate or PCT international application having a filing date before that of the application for which priority is claimed.

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I hereby claim the benefit under Title 35, United States Code, Section 119(e) of any United States provisional application(s) listed below.

(Application No.) (出願番号)	(Filing Date) (出願日)

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(Application No.) (出願番号)	(Filing Date) (出願日)

(Status: Patented, Pending, Abandoned)
(現況：特許許可、係属中、放棄)

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I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.

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POWER OF ATTORNEY: As a named inventor, I hereby appoint the following attorney(s) and/or agent(s) to prosecute this application and transact al business in the Patent and Trademark Office connected therewith (list name and registration number)

WILLIAM S. FROMMER, Registration No. 25,506 and
DENNIS M. SMID, Registration No. 34,930

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745 Fifth Avenue
New York, New York 10151

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Direct Telephone Calls to: (212) 588-0800
To the attention of: **WILLIAM S. FROMMER**

1-00

唯一または第一発明者氏名

Full name of sole or first inventor

Katsumi TAHARA

発明者の署名　　日付

inventor's signature　　Date

Katsumi Tahara　January 31/2001

住所

Residence

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国籍

Citizenship

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Post Office Address:

Sony Corporation
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Shinagawa-Ku, Tokyo 141, Japan

2-00

第二共同発明者がいる場合、その氏名

full name of second joint inventor, if any

Yoshihiro MURAKAMI

第二共同発明者の署名　　日付

Second Inventor's signature　　Date

Yoshihiro Murakami　February 4, 2001

住所

Residence

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国籍

Citizenship

Japan

郵便の宛先

Post Office Address

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7-35 Kitashinagawa 6-Chome
Shinagawa-Ku, Tokyo 141, Japan

（第三以下の共同発明者についても同様に記載し、署名をすること）

(Supply similar information and signature for third and subsequent joint inventors)

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WILLIAM S. FROMMER, Registration No. 25,506 and
DENNIS M. SMID, Registration No. 34,930

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To the attention of: **WILLIAM S. FROMMER**

第三共同発明者がいる場合、その氏名

Full name of third joint inventor, if any

3-00

James Hedley WILKINSON

第三共同発明者の署名　日付

Third inventor's signature　Date

James Hedley Wilkin　5th March 2001

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Residence

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国籍

Citizenship

U.K.

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Full name of fourth joint inventor, if any

第四共同発明者の署名　日付

Fourth Inventor's signature　Date

住所

Residence

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Citizenship

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Shinagawa-Ku, Tokyo 141, Japan

（第五以下の共同発明者についても同様に記載し、署名をすること）

(Supply similar information and signature for fifth and subsequent joint inventors)